

BIOLOGICAL EVALUATION OF SOUTHERN PINE BEETLE
ON THE HOMOCHITTO NATIONAL FOREST

by

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Abstract

Aerial surveys and ground checks for southern pine beetle (SPB) were conducted on 185,532 acres of the Homochitto National Forest in Mississippi. During July 1982 the Bude Ranger District (RD) had an estimated 161 active spots, 76,811 acres of susceptible host type, and 2.1 SPB spots/1000 acres of host type. The Homochitto RD had 66 active spots, 62,744 acres of susceptible host type, and 1.1 SPB spots/1000 acres of host type. Forest Pest Management recommends SPB suppression projects to be initiated on both the Bude and Homochitto RD's.

INTRODUCTION

Biological evaluations were conducted on the Homochitto National Forest to determine the status of southern pine beetle (Dendroctonus frontalis Zimm.) populations. Entomologists from State & Private Forestry, Forest Pest Management (FPM), Alexandria, LA, Field Office conducted the evaluations on June 28-29, 1982, on the Bude Ranger District (RD) and July 8-9, 1982, on the Homochitto RD.

Historical Information

During the past 12 years the Homochitto National Forest has periodically experienced SPB outbreaks (Terry and Wilmore 1970, Terry et al. 1974, Moore and Ragenovich 1975, Weiss and Peachner 1976, Rogers 1976, Twardus 1977, Connor 1979, Connor and Nettleton 1980).

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Figure 1 indicates the number of multiple tree spots on the Homochitto National Forest for the years 1970-1982.^{2/}

The most recent increase in SPB activity was in the fall of 1979. During this outbreak the largest spots observed were approximately 170 trees in size. The ratio of green infested trees to red infested trees was 6:1 on the Homochitto RD and 2.5:1 on the Bude RD.

Between 1970 and 1979 the major peak in activity was in 1976 when both the Homochitto and Bude RD's experienced an increase in the number of multiple tree spots. In January 1976, there were no spots larger than 50 trees. By August 1976, the number of multiple tree spots had decreased, but the spot size had increased up to 100 trees on the Bude RD and 150 on the Homochitto RD. Throughout this period the Homochitto National Forest has probably experienced the highest level of endemic SPB populations of any National Forest in the Alexandria Field Office zone.

METHOD OF EVALUATION AND ANALYSIS OF SPB INFESTATION

Aerial Survey and Ground Checks

Standard aerial sketch map procedures were used for this evaluation, except survey coverage was 100 percent. The aerial survey was conducted by district personnel (June 22 on the Bude and July 2 on the Homochitto) and spots of red and/or fading trees were recorded and plotted on Forest Service Class A maps. Spots were randomly selected for ground checking.

Numbers of vacated and infested trees, basal area, age, height, percentage of the stand in sawtimber, and landform were recorded. This information was used to run the benefit/cost analysis and to hazard rate the stands.

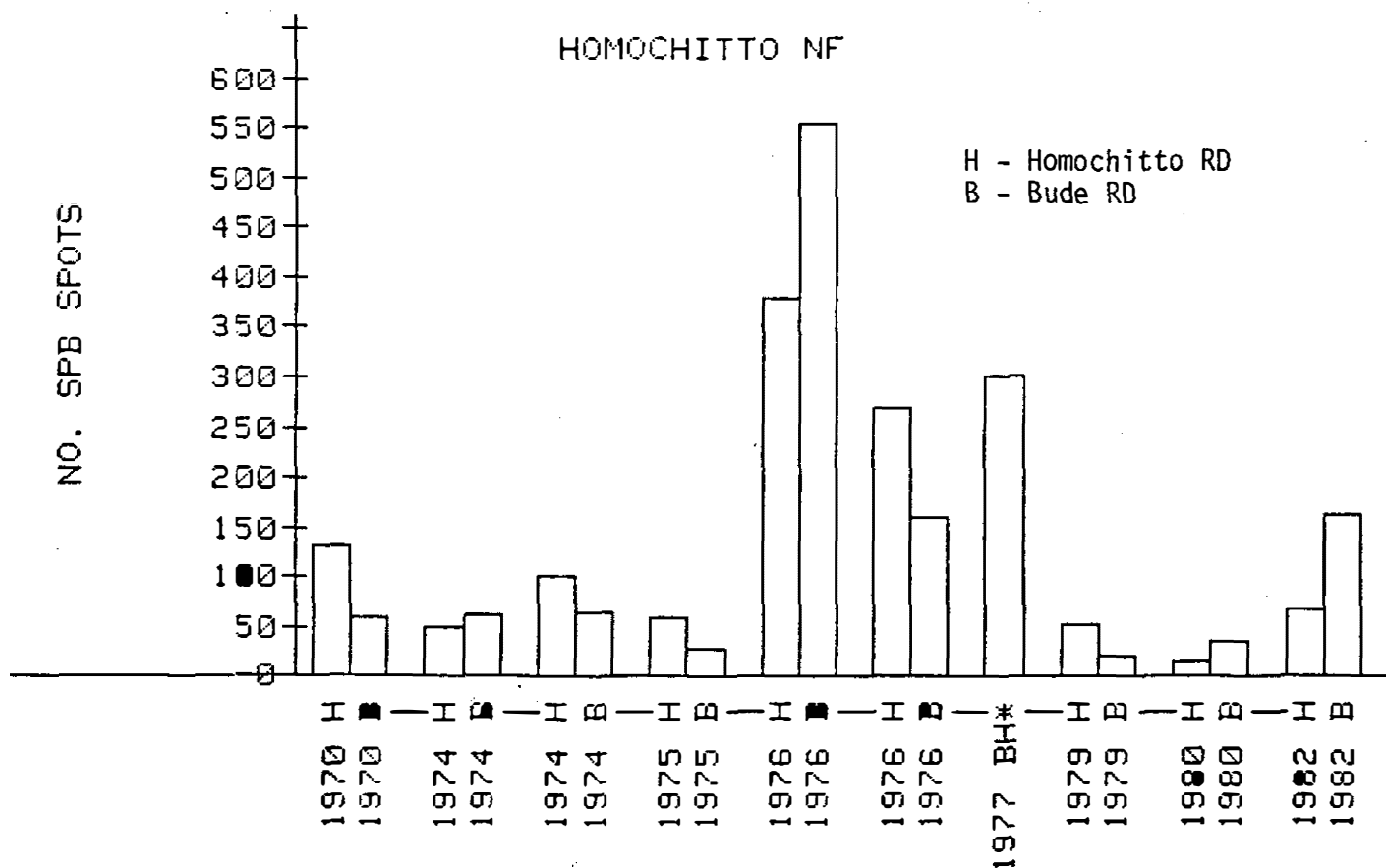
Hazard Rating

All the SPB infested stands were hazard rated at the time of ground checking. This is part of FPM's effort to validate SPB hazard rating systems whenever the opportunity exists. The system used was developed on the Kisatchie National Forest by Dr. Peter Lorio of the Southern Forest Experiment Station. It is designed for use by the National Forests in Region 8 and utilizes field data collected by the prescriptionist during the field procedure (FSH 2409.21d R8 Kisatchie National Forest Supplement No. 7). Due to the similar nature of the forest conditions between central Louisiana and southwestern Mississippi, we feel that this hazard rating system should accurately reflect host/site/stand characteristics associated with SPB attack on the Bude RD (Lorio and Sommers 1981).

^{2/}

Some years are not shown because evaluations were not conducted, and other years appear twice because two evaluations were conducted.

Figure 1. Number of multiple tree spots on the Homochitto NF between the years 1970-1982.



*The number of southern pine beetle spots in 1977 was recorded as one figure for the entire Homochitto National Forest.

Suppression Project Criteria

Decisions to initiate a SPB suppression project were based on the following criteria:

- Number of SPB spots per 1,000 acres of susceptible host type

This figure provides an indication of current levels of SPB activity. Historically, 1 multiple tree spot/1,000 acres of susceptible host type has been considered the lower threshold of a SPB epidemic. However, 1 or more spots/1,000 acres of susceptible host type do not always require that a SPB suppression project be undertaken. This is the case when the majority of the spots are small, involving minimal timber losses, and individual spots are likely to go inactive. To determine the number of acres of susceptible host type the Continuous Inventory of Stand Conditions (CISC) data for the Homochitto National Forest was accessed and number of acres of loblolly-hardwood, longleaf, loblolly, shortleaf, and bottomland hardwood-yellow pine were determined (forest type codes 13, 21, 31, 32, and 46). Regeneration, seedling-sapling and sparse stand, acreage was subtracted from the total as these areas have little chance of sustaining large losses to SPB.

- Green tree:red tree ratios

These ratios, based only on infested trees, provide an indication of how rapidly a SPB spot is expanding at the time of ground check.

- Additional timber loss in each spot for the 30 day period following ground check

A formula developed by Billings and Hynum (1980) was used to predict additional timber loss during the 30 day period following ground checks. This formula uses total basal area (TBA), and number of trees infested at the initial visit (IAT) to predict additional trees killed in a 30 day period (ATK). This model has not been adequately validated for the Homochitto National Forest area so no statistical acceptance levels or confidence intervals are given for these values. The number of spots showing additional timber loss and the size of this loss are used to provide an indication of whether SPB losses will continue. Even if a large number of SPB spots occur on a district they are relatively unimportant if additional timber losses are small.

- Volume of timber currently infested and economic evaluation

The volume of timber currently infested is calculated from the ground checked SPB spots. The currently infested volume is used in the Southern Pine Beetle Economic Evaluation Program (SPBEEP) to

develop the economic benefit cost ratio, internal rate of return, targets for timber to be removed, and the volume of timber protected by control efforts. As the volume of timber currently infested with SPB increases, the economic benefits from a SPB suppression project also increase.

- Entomological judgment

Professional experience and field observations from the ground checked spots are used to interpret and supplement the technical data to reach a final decision.

RESULTS AND DISCUSSION

BUDE RANGER DISTRICT

An aerial detection flight on June 22, 1982, revealed 221 multiple tree spots. Of the 22 spots ground checked by FPM and district personnel, 16 were active and 6 were inactive. Therefore, 73% of the spots were actively infested by SPB. It was assumed that this was true for the entire ranger district, so 161 spots were considered active. The data for spots ground checked by FPM are summarized in table 1.

Figure 2 shows the areas of heaviest SPB infestation. There is a total of 76,811 acres of susceptible host type on the Bude RD with a mean of 2.1 SPB spots/1000 acres of susceptible host type.

Active spots ground checked ranged in size from 22-193 trees and the mean ratio of green infested trees:red infested trees was 2.6:1. These spots were rapidly expanding and contained many trees with fresh attacks.

Trend

Of the 12 spots ground checked all were predicted to have additional timber loss during the 30 day period following ground checks (table 1). The range in predicted spot growth was 5 to 65 trees with a mean of 32 trees per spot.

Economic Analysis

The estimated volume of trees currently infested is 2,279 MBF. If a SPB suppression project were undertaken it is estimated that 1,874 MBF would be removed and 1,162 MBF would be protected. For detailed information on the economic benefits with and without a project refer to Appendix I.

Hazard Rating

Of the 12 infestations ground checked, 9 rated as high or medium risk to SPB attack. Two of the stands were low risk because they were loblolly

Table 1. Summary of ground check data for the Bude Ranger District, Homochitto National Forest, July 1982.

Spot No.	Total No. Trees	No. Infested Trees			No. Vacated Trees				% Infested	Green:Red Ratio ^{a/}	Additional		Total Basal Area
		Total	Green	Red	Total	Green	Red	Black			Spot Growth Loss ^{b/}	Age	
1	25	19	14	5	6	0	6	0	76	2.8:1	5	50	100
2	45	30	28	2	15	2	13	0	67	14.0:1	22	45	160
3	112	84	65	19	28	1	27	0	75	3.4:1	65	40	140
4	130	80	63	17	50	3	47	0	62	3.7:1	47	60	110
5	138	71	59	12	67	1	66	0	51	4.9:1	45	55	120
6	193	55	35	20	138	0	138	0	29	1.8:1	33	11	120
7	66	52	18	34	14	0	14	0	79	0.5:1	28	48	110
8	98	93	68	25	5	0	5	0	95	2.7:1	50	52	100
9	77	62	45	17	15	0	15	0	81	2.6:1	35	55	110
10	81	67	55	12	14	0	14	0	83	4.6:1	42	48	120
11	59	21	5	16	38	1	29	8	36	0.3:1	9	38	120
12	22	15	15	0	7	1	6	0	68	15.0:1	7	50	150
TOTAL	1,046	649	470	179	397	9	380	8	-	-	388	-	-
MEAN	87	54	39	15	33	.8	32	.7	62	2.6:1	32	46	122

^{a/} Based on infested trees only.

^{b/} Additional number of trees lost over 30 days during summer months. Based on formula
 $ATK = [(0.000202 \text{ IAT} \times \text{TBA}) - 0.2211] \times 30$ (Billings & Hynum 1980).

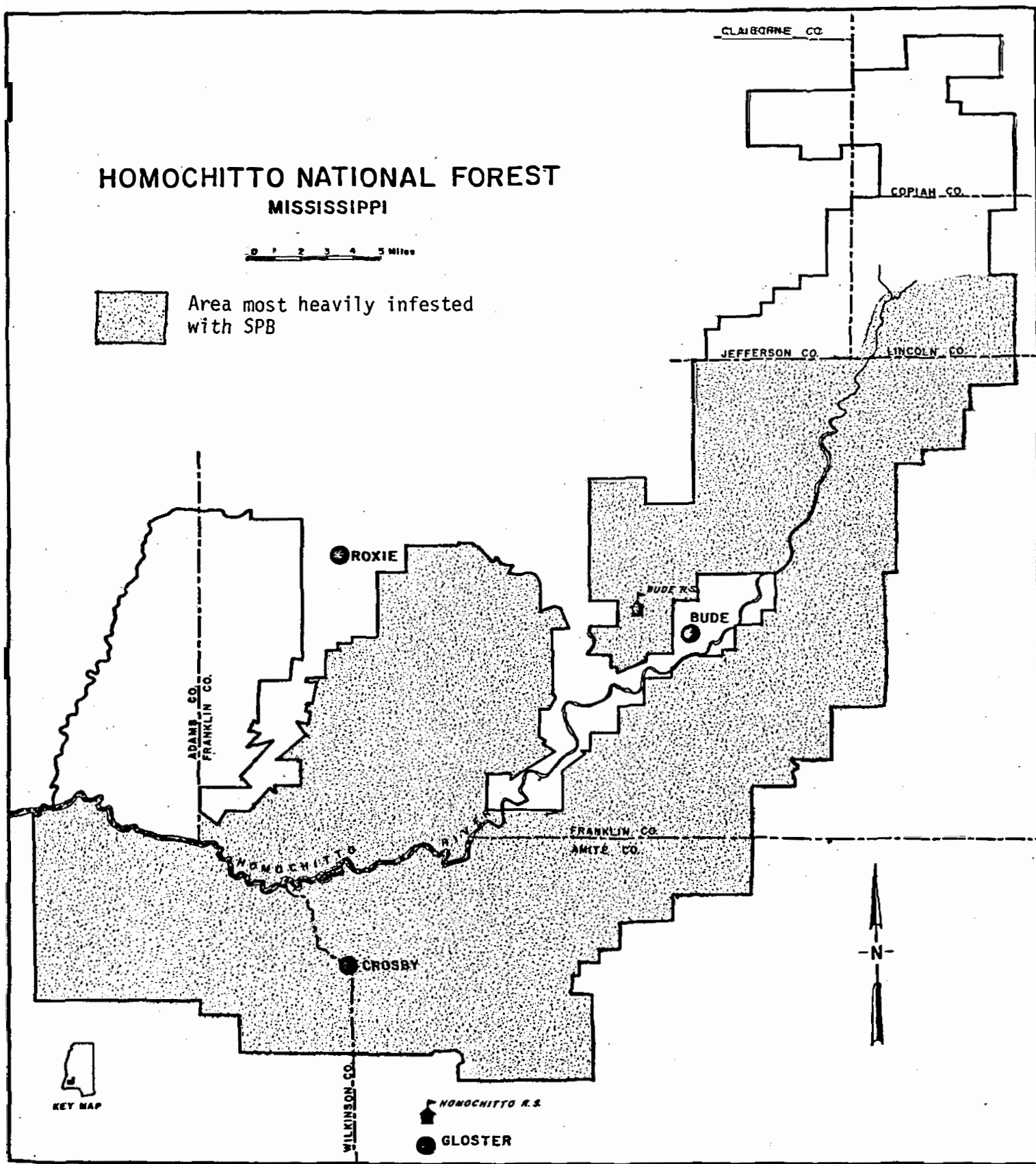


Figure 2. Location of heaviest southern pine beetle activity

pine-hardwood mixtures and the other spot occurred in a young plantation. Lorio found on the Kisatchie National Forest that the majority of large SPB infestations occurred in loblolly pine stands that were immature or mature sawtimber, well stocked, and on good sites (90 or better site index). This seems to hold true for the Bude RD as table 2 demonstrates. Whenever feasible, spots occurring in high hazard stands should be controlled first as they have the greatest potential for substantial timber loss.

HOMOCHITTO RANGER DISTRICT

An aerial detection flight on July 2, 1982, located 99 multiple tree SPB spots. After preliminary ground checking by ranger district personnel and FPM, it was determined that approximately one-third of these infestations were inactive; therefore, 66 multiple tree SPB spots were currently infested on the Homochitto RD at the time of the evaluation. The data for the spots ground checked by FPM are summarized in table 3.

Figure 2 shows the area of heaviest SPB activity. There is a total of 62,744 acres of susceptible host type on the Homochitto RD with a mean of 1.1 SPB spots/1000 acres of susceptible host type.

Active spots ground checked ranged in size from 59-273 trees and the mean ratio of green infested trees:red infested trees was 2.9:1. These spots were rapidly expanding and contained many trees with fresh attacks.

Trend

Of the 8 spots ground checked all were predicted to have additional timber loss during the 30 day period following ground checking (table 3). The range in predicted spot growth was 21 to 121 trees with a mean of 58 trees.

Economic Analysis

The estimated volume of trees currently infested is 1,145 MBF. If a SPB suppression project were undertaken it is estimated that 1,030 MBF would be removed and 1,089 MBF would be protected. For detailed information on the economic benefits with and without a project refer to Appendix 1.

Hazard Rating

All of the 8 infestations rated as high or medium risk to SPB attack. Lorio found on the Kisatchie National Forest that the majority of large SPB infestations occurred in loblolly pine stands that were immature or mature sawtimber, well stocked, and on good sites (90 or better site index).

Table 2. SPB hazard rating summary for infestation locations, Bude Ranger District, Homochitto National Forest, July 1982.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Pine Species	SPB Hazard Rating
1	100	80	92	100	15	50	Loblolly	Medium
2	160	140	105	110	16	45	Loblolly	High
3	140	130	90	100	13	40	Loblolly	High
4	110	50	125	120	16	60	Loblolly	Low
5	120	120	93	100	15	55	Loblolly	High
6	120	120	30	100	6	11	Loblolly	Low
7	110	90	95	100	13	48	Loblolly	Medium
8	100	90	125	120	17	52	Loblolly	Medium
9	110	60	104	100	18	55	Loblolly	Low
10	120	110	95	100	16	48	Loblolly	High
11	120	110	98	100	12	38	Loblolly	High
12	150	120	125	120	16	50	Loblolly	High
MEAN	122	102	98	106	14	46	-	-

Table 3. Summary of the ground check data for the Homochitto Ranger District, Homochitto National Forest, July 1982.

Spot No.	Total No. Trees	No. Infested Trees			No. Vacated Trees				% Infested	Green:Red Ratio ^{a/}	Additional Spot Growth Loss ^{b/}	Age	Total Basal Area
		Total	Green	Red	Total	Green	Red	Black					
1	120	64	31	33	56	2	47	7	53	0.9:1	40	57	120
2	160	98	77	21	62	2	49	11	61	3.7:1	71	58	130
3	273	150	109	41	123	6	95	22	55	2.7:1	121	30	140
4	155	114	96	18	41	12	19	10	74	5.3:1	76	55	120
5	59	57	37	20	2	0	2	0	97	1.9:1	42	50	140
6	265	133	117	16	132	0	126	6	50	7.3:1	58	55	80
7	76	41	24	17	35	0	29	6	54	1.4:1	21	30	110
8	74	49	32	17	25	0	23	2	66	1.9:1	35	60	140
TOTAL	1,182	706	523	183	476	22	390	64	-	-	464	-	-
MEAN	148	88	65	23	60	3	49	8	59	2.9:1	58	49	123

^{a/} Based on infested trees only.

^{b/} Additional number of trees lost over 30 days during summer months. Based on formula
 $ATK = [(0.000202 \text{ IAT} \times \text{TBA}) - 0.2211] \times 30$ (Billings and Hynum 1980).

This holds true for the ground checked spots on the Homochitto RD as table 4 demonstrates. Whenever feasible, spots occurring in high hazard stands should be controlled first as they have the greatest potential for substantial timber loss.

RECOMMENDATIONS

Based on the number of SPB spots/1000 acres of susceptible host type, the ratio of green infested to red infested trees, predictions for additional losses and the economic analysis, FPM recommends a suppression project for both the Bude and the Homochitto RD's. We recommend using primarily the salvage and cut-and-leave techniques for spot suppression. A detailed description of these and other control alternatives is addressed in Appendix II.

Due to the large number of spots needing treatment we also recommend using the Southern Pine Beetle Fact Sheet No. 3 (Anonymous 1979) or Texas Forest Service Circular 249 (Billings and Hynum 1980) to establish spot priorities for control. In addition, a hazard rating program using CISC information (Lorio and Sommers 1981) has been developed to print a listing of high and medium risk stands. Those spots in high hazard areas and likely to increase in size should receive priority for removal. Following these procedures will reduce SPB losses. We have sent a copy of this listing to each district for their use.

If timber markets become a problem and quotas are established, we recommend cutting only the buffer strip and infested trees. This will control SPB and reduce the amount of timber going to markets, so more spots can be controlled. The remaining vacated trees will provide some value as wildlife snags.

Table 4. SPB hazard rating summary for infestation locations, Homochitto Ranger District, Homochitto National Forest, July 1982.

Spot No.	Total Basal Area	Pine Basal Area	Total Tree Height	Site Index	Diameter (in.)	Age	Predominant Pine Species	SPB Hazard Rating
1	120	110	90	90	14	57	Loblolly	High
2	130	130	100	100	15	58	Loblolly	High
3	140	130	90	120	16	30	Loblolly	High
4	120	110	95	90	14	55	Loblolly	High
5	140	130	90	90	14	50	Loblolly	High
6	80	80	80	80	14	55	Loblolly	Medium
7	110	110	90	120	12	30	Loblolly	High
8	140	120	120	110	18	60	Loblolly	High
MEAN	122	115	94	100	15	49	-	-